CLAIMS

[Claim(s)]
[Claim 1]
A device which transmitted a modulating signal modulated by a digital modulation method, comprising:
A phase control means which controls a phase of said modulating signal based on information on variation of phase contrast to which a phase of said modulating signal was changed.
A demodulation means which restores to a modulating signal after said phase control.

[Claim 2]
The signal processor according to claim 1 to which said phase control means changes phase contrast of a signal point of a signal point before transition of a signal, and the transition back.
[Claim 3]
The signal processor according to claim 1 or 2 which makes a phase of a modulating signal a predetermined phase when said phase control means does not have variation of phase contrast.
[Claim 4]
The signal processor according to claim 1 or 2 to which a phase of a modulating signal is not changed when said phase control means does not have variation of phase contrast.
[Claim 5]
The signal processor according to any one of claims 1 to 4 to which a phase of a modulating signal is changed with predetermined angle of rotation when a phase control means is transition predetermined in a decision result.
[Claim 6]
The signal processor according to any one of claims 1 to 5 with which said phase control means carries out the multiplication of the unit vector to a modulating signal.
[Claim 7]
A communication apparatus comprising:
A reception means which receives a modulating signal.
The signal processor according to any one of claims 1 to 6.

[Claim 8]
The communication apparatus according to claim 7 which possesses a topology reception means which receives information on variation of phase contrast and to which a phase of a signal which received said signal processor according to information on variation of said phase contrast is changed.
[Claim 9]
In [when it judges with a peak power occurring in the transmitting side from transition of a signal point of a signal modulated by a digital modulation method, change a phase of a signal point before transition of a modulating signal, or a signal point after transition before a band limit, and] a receiver, A signal processing method controlling a phase of a modulating signal after said phase change, and considering it as a modulating signal before a phase change.

[Translation done.]

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1]The block diagram showing the composition of the signal processor concerning the embodiment of the invention 1
[Drawing 2]The flow chart showing an example of operation of the signal processor of the above-mentioned embodiment
[Drawing 3]The figure showing an example of the signal point arrangement of a 16QAM method
[Drawing 4]The block diagram showing the composition of the signal processor concerning the above-mentioned embodiment
[Drawing 5]The flow chart showing an example of operation of the signal processor of the above-mentioned embodiment
[Drawing 6]The block diagram showing the composition of the communication apparatus concerning the embodiment of the invention 2
[Drawing 7]The block diagram showing the composition of the communication apparatus concerning the above-mentioned embodiment
[Drawing 8]The block diagram showing the composition of the conventional signal processor
[Description of Notations]
101 Digital modulation machine
102 Modulating-signal judgment part
103 Control signal generation machine
104 and 403 Phase control machine
105 Band limit filter
106 Quadrature modulation machine
401 Orthogonal demodulators
402 Control signal extractor
404 Digital demodulation machine
601 Wireless transmission part
602 Topology transmission section
701 Radio receiving part
702 Topology receive section

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention]
About a signal processor and a signal processing method, especially this invention is used for the modulating signal of radio communication equipment, and relates to a suitable signal processor and signal processing method.
[0002]
[Description of the Prior Art]
After carrying out digital modulation of the modulation part of the radio communications system using a digital quadrature modulation method conventionally, the composition which band-limits by using a band limit filter is used widely. Drawing 8 is a block diagram showing the composition of the conventional signal processor. In drawing 8, the signal processor 10 comprises the digital modulation machine 11, the band limit filter 12, and the quadrature modulation machine 13.
[0003]
The digital modulation machine 11 generates the orthogonal modulation signal acquired by carrying out digital modulation of the send data, and outputs it to the band limit filter 12. The band limit filter 12 outputs the rectangular baseband signal acquired by restricting the zone of an orthogonal modulation signal to the quadrature modulation machine 13. The quadrature modulation machine 13 outputs the transmit modulation signal acquired by carrying out quadrature modulation processing to the band-limited rectangular baseband signal.
[0004]
[Problem(s) to be Solved by the Invention]
However, in the signal (signal point) with which transmission time adjoins, in the conventional device, overlapping peak electric power generates the modulating signal which restricted the zone. In the case of the signal modulated especially by the rectangular multi-level modulation method, when signals with large amplitude lap, the large signal of amplitude value occurs. As a result, there is a problem which the dynamic range of the modulating signal after a band limit expands. And the linearity which covers a dynamic range to the device which processes a modulating signal is required.
[0005]
This invention is made in view of this point, and is a thing.
The purpose is to provide the signal processor and signal processing method which oppress the dynamic range of the modulating signal of **.

[0006]
[Means for Solving the Problem]
In a device with which a signal processor of this invention transmitted a modulating signal modulated by a digital modulation method, Composition possessing a phase control means which controls a phase of said modulating signal based on information on variation of phase contrast to which a phase of said modulating signal was changed, and a demodulation means which restores to a modulating signal after said phase control is taken.
[0007]

A signal processor of this invention takes composition to which said phase control means changes phase contrast of a signal point of a signal point before transition of a signal, and the transition back. A signal processor of this invention takes composition which makes a phase of a modulating signal a predetermined phase, when said phase control means does not have variation of phase contrast. A signal processor of this invention takes composition to which a phase of a modulating signal is not changed, when said phase control means does not have variation of phase contrast. A signal processor of this invention takes composition to which a phase of a modulating signal is changed with predetermined angle of rotation, when a phase control means is transition predetermined in a decision result.

[0008]

According to these composition, according to information on a phase change, it can restore to a signal which it judged with a peak power occurring, and a phase of one of signal points was changed before transition of a modulating signal, or after transition, and was transmitted at the transmitting side correctly after reception by changing a phase of a signal after orthogonal demodulation.

[0009]

As for a signal processor of this invention, said phase control means takes composition which carries out the multiplication of the unit vector to a modulating signal.

[0010]

According to this composition, only a phase can be changed, without changing amplitude value of a modulating signal.

[0011]

A communication apparatus of this invention takes a reception means which receives a modulating signal, and composition possessing the above-mentioned signal processor. A communication apparatus of this invention possesses a topology reception means which receives information on variation of phase contrast, and said signal processor takes composition to which a phase of a signal received according to information on variation of said phase contrast is changed.

[0012]

According to these composition, according to information on a phase change, it can restore to a signal which it judged with a peak power occurring, and a phase of one of signal points was changed before transition of a modulating signal, or after transition, and was transmitted at the transmitting side correctly after reception by changing a phase of a signal after orthogonal demodulation.

[0013]

When it judges with a peak power generating a signal processing method of this invention in the transmitting side from transition of a signal point of a signal modulated by a digital modulation method, A phase of a signal point before transition of a modulating signal or a signal point after transition was changed before a band limit, and in a receiver, a phase of a modulating signal after said phase change is controlled, and it was made to consider it as a modulating signal before a phase change.

[0014]

According to this method, according to information on a phase change, it can restore to a signal which it judged with a peak power occurring, and a phase of one of signal points was changed before transition of a modulating signal, or after transition, and was transmitted at the transmitting side correctly after reception by changing a phase of a signal after orthogonal demodulation.

[0015]

[Embodiment of the Invention]

When the zone of the signal which carried out digital modulation was restricted, this invention person finds out that an adjoining signal laps, intersymbol interference occurs, and the large signal of a peak power occurs when signals with large amplitude lap, and came to do this invention.

[0016]

Namely, the main point of this invention judges generating of a peak power from transition of the signal point of the signal modulated by the digital modulation method, When it judges with a peak power occurring, it is changing the phase contrast of the signal point of the signal point before transition of a modulating signal, and the transition back, preventing signals with large amplitude lapping, and preventing generating of the large signal of a peak power. And it is easing the increase of a dynamic range required

of the communication apparatus which transmits the modulating signal after a band limit.
[0017]
Hereafter, an embodiment of the invention is described in detail with reference to drawings.
(Embodiment 1)
Drawing 1 is a block diagram showing the composition of the signal processor concerning the embodiment of the invention 1. the signal processor 100 of drawing 1 -- the digital modulation machine 101, the modulating-signal judgment part 102, the control signal generation machine 103, the phase control machine 104, the band limit filter 105, the quadrature modulation machine 106, ** et al. -- it is mainly constituted.
[0018]
In drawing 1, the digital modulation machine 101 outputs the modulating signal acquired by carrying out digital modulation of the send data to the modulating-signal judgment part 102 and the phase control machine 104. For example, the digital modulation machine 101 maps send data according to the signal point arrangement defined by quadrature amplitude modulations, such as a 16QAM (Quadrature Amplitude Modulation) method, and acquires a modulating signal.
[0019]
The modulating-signal judgment part 102 judges whether a peak power occurs from transition of the signal point of this modulating signal about the modulating signal modulated in the digital modulation machine 101. For example, the modulating-signal judgment part 102 measures transition of the predetermined signal point which continues 2 unit time, and when the signal point before transition and the signal point after transition are the same phases and both signal points are maximum amplitude values, it judges that a peak power occurs.
[0020]
And the modulating-signal judgment part 102 outputs a decision result to the control signal generation machine 103. For example, when it is judged that the modulating-signal judgment part 102 outputs the decision result "1", and a peak power does not generate it when it is judged that a peak power occurs, the modulating-signal judgment part 102 outputs the decision result "0."
[0021]
The control signal generation machine 103 outputs the phase control signal which carried out the phase shift to the phase control machine 104 and the exterior, when the decision result of the modulating-signal judgment part 102 is the judgment which a peak power generates. The control signal generation machine 103 outputs the phase control signal which has not carried out a phase shift to the phase control machine 104, when the decision result of the modulating-signal judgment part 102 is the judgment which a peak power does not generate. This phase control signal sets a unit vector, i.e., amplitude value, to "1" (non-unit), changes only the phase of a modulating signal, and does not change amplitude value.
[0022]
The phase control machine 104 changes the phase of a modulating signal using the control signal outputted from the control signal generation machine 103. For example, the phase control machine 104 outputs the modulating signal acquired by carrying out complex multiplication of the control signal and modulating signal which were outputted from the control signal generation machine 103 to the band limit filter 105. Any of the signal point before transition or the signal point after transition may be sufficient as the signal point to which a phase is changed among the signal points of a modulating signal.
[0023]
For example, the phase control machine 104 changes the phase of the signal point after transition 90 degrees, and changes the phase contrast of the signal point before transition, and the signal point after transition.
[0024]
As a result, when it is judged that a peak power occurs, the phase contrast of the signal point of the signal point before transition of a modulating signal and the transition back changes. When it is judged that a peak power does not occur, the phase contrast of the signal point of the signal point before transition of a modulating signal and the transition back does not change.
[0025]

The band limit filter 105 restricts the zone of the modulating signal outputted from the phase control machine 104. And the band limit filter 105 is outputted to the quadrature modulation machine 106 by making the band-limited modulating signal into a rectangular baseband signal. The quadrature modulation machine 106 modulates and outputs a rectangular baseband signal.

[0026]

Next, operation of the signal processor concerning this embodiment is explained. Drawing 2 is a flow chart showing an example of operation of the signal processor of this embodiment.

[0027]

In Step (henceforth "ST") 201, digital modulation of the send data is carried out in the digital modulation machine 101. In ST202, it is judged in the modulating-signal judgment part 102 whether a peak power occurs in a modulating signal. When a peak power occurs in a modulating signal, it progresses to ST203, and when a peak power does not occur in a modulating signal, it progresses to ST204.

[0028]

In ST203, a modulating signal changes a predetermined part phase in the phase control machine 104. In ST204, the zone of a modulating signal is restricted in the band limit filter 105. In ST205, quadrature modulation of the modulating signal is carried out in the quadrature modulation machine 106.

[0029]

Thus, according to the signal processor of this embodiment, generating of a peak power is judged from transition of the signal point of the signal modulated by the digital modulation method, When transition of a signal point is predetermined transition, judge with a peak power occurring and the phase of one of signal points is changed before transition of a modulating signal, or after transition, It can prevent signals with large amplitude lapping, generating of the large signal of a peak power can be prevented, and the dynamic range of the modulating signal after a band limit can be oppressed.

[0030]

In the above-mentioned explanation, when the signal point before transition and the signal point after transition are the same phases and both signal points are maximum amplitude values, it has judged that a peak power occurs, but it will not be limited especially if it is the conditions which a peak power generates.

[0031]

The example hereafter judged as a peak power occurring is explained. Drawing 3 is a figure showing an example of the signal point arrangement of a 16QAM method. In drawing 3, the signal points 301-334 show the signal point modulated by 16QAM.

[0032]

For example, since the signal point before and behind transition is the same phase and both signal points are maximum amplitude values when the signal point 301 continues, the modulating-signal judgment part 102 judges that a peak power occurs. Similarly, since the signal point before and behind transition is the same phase and both signal points are maximum amplitude values when the signal point 311 continues and the signal point 321 continues, or when the signal point 331 continues, the modulating-signal judgment part 102 judges that a peak power occurs.

[0033]

As another example, the signal point before and behind transition is the same phase or a phase different 180 degrees, and both signal points are maximum amplitude values, and the modulating-signal judgment part 102 judges that a peak power occurs, when changing from the signal point 301 at the signal point 301 or the signal point 321. When similarly the modulating-signal judgment part 102 changes from the signal point 311 at the signal point 311 or the signal point 331, When changing from the signal point 321 at the signal point 321 or the signal point 301, when changing from the signal point 331 at the signal point 331 or the signal point 311, the signal point before and behind transition is the same phase or a phase different 180 degrees, and both signal points are maximum amplitude values, and it is judged that a peak power occurs.

[0034]

As another example, the modulating-signal judgment part 102, When changing from either of the signal points 301, 302, and 303 to either of the signal points 301, 302, and 303, When each signal point before and behind transition is either of the signal points when the distance during a signal point is the nearest

at the signal point of the peak magnitude, or the signal point of the first half peak magnitude, it is judged that a peak power occurs.

[0035]

Similarly when changing from either of the signal points 311, 312, and 313 to either of the signal points 311, 312, and 313, the modulating-signal judgment part 102 the modulating-signal judgment part 102, When changing from either of the signal points 321, 322, and 323 to either of the signal points 321, 322, and 323, the modulating-signal judgment part 102, When changing from either of the signal points 331, 332, and 333 to either of the signal points 331, 332, and 333, each signal point before and behind transition is either of the signal points when the distance during a signal point is the nearest, and judges at the signal point of the peak magnitude, or the signal point of the first half peak magnitude that a peak power occurs.

[0036]

As another example, the modulating-signal judgment part 102, When changing to either of the signal point 301 to the signal points 301, 302, and 303, Or when changing from the signal points 301, 302, and 303 at the signal point 301, Since each signal point before and behind transition is either of the signal points when the distance during a signal point is the nearest at the signal point of the peak magnitude, or the signal point of the first half peak magnitude and one side of the signal point before and behind transition is a signal point of the peak magnitude, it is judged that a peak power occurs.

[0037]

When similarly the modulating-signal judgment part 102 changes to either of the signal point 311 to the signal points 311, 312, and 313, When changing from the signal points 311, 312, and 313 at the signal point 311 and changing to either of the signal point 321 to the signal points 321, 322, and 323, When changing from the signal points 321, 322, and 323 at the signal point 321 and changing to either of the signal point 331 to the signal points 331, 332, and 333, Or when changing from the signal points 331, 332, and 333 at the signal point 331, Since each signal point before and behind transition is either of the signal points when the distance during a signal point is the nearest at the signal point of the peak magnitude, or the signal point of the first half peak magnitude and one side of the signal point before and behind transition is a signal point of the peak magnitude, it is judged that a peak power occurs.

[0038]

As another example, the modulating-signal judgment part 102, When changing to either of the signal points 301, 302, 303, 321, 322, and 323 from either of the signal points 301, 302, 303, 321, 322, and 323, It is the signal point of the peak magnitude when a phase differs in each signal point before and behind transition from the signal point of the peak magnitude, or the signal point of the first half peak magnitude about 180 degrees or said one of signal points, or signal point when the distance during a signal point is the nearest, and it is judged that a peak power occurs.

[0039]

Similarly, when changing to either of the signal points 311, 312, 313, 331, 332, and 333 from either of the signal points 311, 312, 313, 331, 332, and 333, the modulating-signal judgment part 102, It is the signal point of the peak magnitude when a phase differs in each signal point before and behind transition from the signal point of the peak magnitude, or the signal point of the first half peak magnitude about 180 degrees or said one of signal points, or signal point when the distance during a signal point is the nearest, and it is judged that a peak power occurs.

[0040]

As another example, the modulating-signal judgment part 102, When changing to either of the signal point 301 or 321 to the signal points 301, 302, 303, 321, 322, and 323, Or when changing at the signal point 301 or 321 from either of the signal points 301, 302, 303, 321, 322, and 323, The signal point of the peak magnitude when a phase differs in each signal point before and behind transition from the signal point of the peak magnitude, or the signal point of the first half peak magnitude about 180 degrees, And since it is either said one of signal points or signal point when the distance during a signal point is the nearest and one side of the signal point before and behind transition is a signal point of the peak magnitude, it is judged that a peak power occurs.

[0041]

When similarly the modulating-signal judgment part 102 changes to either of the signal point 311 or 331

to the signal points 311, 312, 313, 331, 332, and 333, Or when changing at the signal point 311 or 331 from either of the signal points 311, 312, 313, 331, 332, and 333, The signal point of the peak magnitude when a phase differs in each signal point before and behind transition from the signal point of the peak magnitude, or the signal point of the first half peak magnitude about 180 degrees, And since it is either said one of signal points or signal point when the distance during a signal point is the nearest and one side of the signal point before and behind transition is a signal point of the peak magnitude, it is judged that a peak power occurs.

[0042]

The digital modulation method in particular of the signal which the signal processor of this embodiment treats is not limited, but can apply quadrature amplitude modulation methods, such as the modulation method which a peak power may generate, for example, 16QAM, and 64QAM.

[0043]

And when the signal point when the amplitude of a digital quadrature amplitude modulation method is large continues, generating of the large signal of a peak power can be prevented and the dynamic range of the modulating signal after a band limit can be oppressed.

[0044]

When it is judged that a peak power occurs, the modulating-signal judgment part 102 outputs the decision result "1", by the above-mentioned explanation, when it is judged that a peak power does not occur, the modulating-signal judgment part 102 explains the example which outputs the decision result "0", but. What is necessary is just to be able to distinguish a decision result, and if it is a signal which can identify two states, it is applicable with any values.

[0045]

Although the amplitude value of a phase control signal considers it as the signal of "1" and is considering it as the operation to which only a phase is changed in the above-mentioned explanation, without changing the amplitude value of a modulating signal, Amplitude value of not only this but a phase control signal may be made into the value of more than "1" or less than "1", and the phase of a modulating signal may be changed, and the amplitude value of a modulating signal may be amplified or attenuated.

[0046]

In the above-mentioned explanation, although the phase of a modulating signal is changed 90 degrees, the variation of a phase is not limited to this. For example, the phase of a modulating signal may be changed 135 degrees. Since the signal point after changing a phase by making change of a phase into 135 etc. degrees etc. in the case of multiple-value quadrature amplitude modulations, such as 16QAM, does not fall on other signal points, the signal point which changed the phase, and the signal point which is not changing can be distinguished, and it can also transmit.

[0047]

The variation of a phase may not be constant and all should just be the variation which can reduce a peak power.

[0048]

In the above-mentioned embodiment, when it is judged that a peak power does not occur, it supposes that the phase contrast of the signal point of the signal point before transition of a modulating signal and the transition back will not change, but the changing method of a phase is not restricted to this. For example, when it is judged that a peak power does not occur, it is good also considering the phase of the signal point before transition of a modulating signal, or the signal point after transition as a predetermined phase.

[0049]

Next, a receiver is explained. Drawing 4 is a block diagram showing the composition of the signal processor concerning the embodiment of the invention 1. The signal processor 400 of drawing 4 mainly comprises the orthogonal demodulators 401, the control signal extractor 402, the phase control machine 403, and the digital demodulation machine 404.

[0050]

The orthogonal demodulators 401 restore to the received orthogonal modulation signal, and output a rectangular baseband signal to the phase control machine 403. The control signal extractor 402 extracts

the information on a phase change from an input signal, and outputs it to the phase control machine 403.
[0051]
According to the information on a phase change, the phase control machine 403 changes the phase of a rectangular baseband signal, and is outputted to the digital demodulation machine 404. The digital demodulation machine 404 restores to a rectangular baseband signal according to the signal point arrangement defined by quadrature amplitude modulations, such as a 16QAM method, and obtains received data.
[0052]
Next, operation of the signal processor concerning this embodiment is explained. Drawing 5 is a flow chart showing an example of operation of the signal processor of this embodiment.
[0053]
In ST501, orthogonal demodulation of the received orthogonal modulation signal is carried out in the orthogonal demodulators 401. In ST502, it is judged in the control signal extractor 402 whether the information on a phase change is included in the control signal in an input signal. When the information on a phase change is included in a control signal, the information on a phase change is outputted to the phase control machine 403, and processing is moved to ST503. When the information on a phase change is not included in a control signal, processing is moved to ST504.
[0054]
In ST503, the phase of a rectangular baseband signal is changed in the phase control machine 403. In ST504, in the digital demodulation machine 404, digital demodulation of the rectangular baseband signal is carried out, and received data are obtained.
[0055]
Thus, according to the signal processor of this embodiment, according to the information on a phase change, by changing the phase of the signal after orthogonal demodulation at the transmitting side. It can restore to the signal which it judged with a peak power occurring, and the phase of one of signal points was changed before transition of a modulating signal, or after transition, and was transmitted correctly after reception.
[0056]
(Embodiment 2)
Drawing 6 is a block diagram showing the composition of the communication apparatus concerning the embodiment of the invention 2. The communication apparatus 600 of drawing 6 mainly comprises the signal processor 100 of Embodiment 1, the wireless transmission part 601, and the topology transmission section 602.
[0057]
The signal processor 100 carries out digital modulation of the send data, judges generating of a peak power from transition of the signal point of the signal modulated by the digital modulation method, and when it judges with a peak power occurring, it changes the phase contrast of the signal point of the signal point before transition of a modulating signal, and the transition back. And the signal processor 100 transmits a modulating signal to the wireless transmission part 601, and outputs the information on the phase change of a modulating signal to the topology transmission section 602.
[0058]
The wireless transmission part 601 changes into a radio frequency the modulating signal outputted from the signal processor 100, and transmits. The topology transmission section 602 changes into coding, abnormal conditions, and a radio frequency the information on the phase change of the modulating signal outputted from the signal processor 100, and transmits.
[0059]
Thus, according to the communication apparatus of this embodiment, generating of a peak power is judged from transition of the signal point of the signal modulated by the digital modulation method, When transition of a signal point is predetermined transition, judge with a peak power occurring and the phase of one of signal points is changed before transition of a modulating signal, or after transition, It can prevent signals with large amplitude lapping, generating of the large signal of a peak power can be prevented, and the dynamic range of the modulating signal after a band limit can be oppressed. As a

result, the communication apparatus can oppress the dynamic range of a sending signal.
[0060]
According to the communication apparatus of this embodiment, the determining operation of the phase change in a receiver can be excluded by transmitting the information on the variation of the phase contrast of the modulating signal in a signal processor.
[0061]
Next, operation of a receiver is explained. The communication apparatus 700 of drawing 7 mainly comprises the signal processor 400 of Embodiment 1, the radio receiving part 701, and the topology receive section 702.
[0062]
The radio receiving part 701 receives the signal transmitted from the communication apparatus 600, carries out frequency conversion to a baseband signal, and is outputted to the signal processor 400. The topology receive section 702 receives the information on the phase change of the modulating signal transmitted from the communication apparatus 600, changes, gets over and decrypts to baseband frequency, and outputs to the signal processor 400. The signal processor 400 restores to the baseband signal outputted from the radio receiving part 701, after performing phase control according to the information on a phase change, and it obtains received data.
[0063]
Thus, according to the communication apparatus of this embodiment, according to the information on a phase change, by changing the phase of the signal after orthogonal demodulation at the transmitting side. It can restore to the signal which it judged with a peak power occurring, and the phase of one of signal points was changed before transition of a modulating signal, or after transition, and was transmitted correctly after reception.
[0064]
It is possible for this invention not to be limited to the above-mentioned embodiment, but to change variously, and to carry out. For example, although the above-mentioned embodiment explains the case where it carries out as a signal processor and a communication apparatus, it is also possible for it not to be restricted to this and to perform this signal processing method as software.
[0065]
For example, the program which performs the above-mentioned signal processing method is beforehand stored in ROM (Read Only Memory), and it may be made to operate the program by CPU (Central Processor Unit).
[0066]
The program which stored the program which performs the above-mentioned signal processing method in the storage which can be read by computer, and was stored in the storage is recorded on RAM (Random Access memory) of a computer, It may be made to operate a computer according to the program.
[0067]
[Effect of the Invention]
As explained above, according to the signal processor and signal processing method of this invention. Generating of a peak power is judged from transition of the signal point of the signal modulated by the digital modulation method, When transition of a signal point is predetermined transition, judge with a peak power occurring and the phase of one of signal points is changed before transition of a modulating signal, or after transition, It can prevent signals with large amplitude lapping, generating of the large signal of a peak power can be prevented, and the dynamic range of the modulating signal after a band limit can be oppressed.
[Brief Description of the Drawings]
[Drawing 1]The block diagram showing the composition of the signal processor concerning the embodiment of the invention 1
[Drawing 2]The flow chart showing an example of operation of the signal processor of the above-mentioned embodiment
[Drawing 3]The figure showing an example of the signal point arrangement of a 16QAM method
[Drawing 4]The block diagram showing the composition of the signal processor concerning the above-

mentioned embodiment
[Drawing 5]The flow chart showing an example of operation of the signal processor of the above-mentioned embodiment
[Drawing 6]The block diagram showing the composition of the communication apparatus concerning the embodiment of the invention 2
[Drawing 7]The block diagram showing the composition of the communication apparatus concerning the above-mentioned embodiment
[Drawing 8]The block diagram showing the composition of the conventional signal processor
[Description of Notations]
101 Digital modulation machine
102 Modulating-signal judgment part
103 Control signal generation machine
104 and 403 Phase control machine
105 Band limit filter
106 Quadrature modulation machine
401 Orthogonal demodulators
402 Control signal extractor
404 Digital demodulation machine
601 Wireless transmission part
602 Topology transmission section
701 Radio receiving part
702 Topology receive section

[Translation done.]

EFFECT OF THE INVENTION

[Effect of the Invention]
As explained above, according to the signal processor and signal processing method of this invention. Generating of a peak power is judged from transition of the signal point of the signal modulated by the digital modulation method, When transition of a signal point is predetermined transition, judge with a peak power occurring and the phase of one of signal points is changed before transition of a modulating signal, or after transition, It can prevent signals with large amplitude lapping, generating of the large signal of a peak power can be prevented, and the dynamic range of the modulating signal after a band limit can be oppressed.

[Translation done.]

MEANS

[Means for Solving the Problem]
In a device with which a signal processor of this invention transmitted a modulating signal modulated by a digital modulation method, Composition possessing a phase control means which controls a phase of said modulating signal based on information on variation of phase contrast to which a phase of said modulating signal was changed, and a demodulation means which restores to a modulating signal after said phase control is taken.
[0007]
A signal processor of this invention takes composition to which said phase control means changes phase contrast of a signal point of a signal point before transition of a signal, and the transition back. A signal processor of this invention takes composition which makes a phase of a modulating signal a predetermined phase, when said phase control means does not have variation of phase contrast. A signal processor of this invention takes composition to which a phase of a modulating signal is not changed, when said phase control means does not have variation of phase contrast. A signal processor of this invention takes composition to which a phase of a modulating signal is changed with predetermined angle of rotation, when a phase control means is transition predetermined in a decision result.
[0008]
According to these composition, according to information on a phase change, it can restore to a signal which it judged with a peak power occurring, and a phase of one of signal points was changed before transition of a modulating signal, or after transition, and was transmitted at the transmitting side correctly after reception by changing a phase of a signal after orthogonal demodulation.
[0009]
As for a signal processor of this invention, said phase control means takes composition which carries out the multiplication of the unit vector to a modulating signal.
[0010]
According to this composition, only a phase can be changed, without changing amplitude value of a modulating signal.
[0011]
A communication apparatus of this invention takes a reception means which receives a modulating signal, and composition possessing the above-mentioned signal processor. A communication apparatus of this invention possesses a topology reception means which receives information on variation of phase contrast, and said signal processor takes composition to which a phase of a signal received according to information on variation of said phase contrast is changed.
[0012]
According to these composition, according to information on a phase change, it can restore to a signal which it judged with a peak power occurring, and a phase of one of signal points was changed before transition of a modulating signal, or after transition, and was transmitted at the transmitting side correctly after reception by changing a phase of a signal after orthogonal demodulation.
[0013]
When it judges with a peak power generating a signal processing method of this invention in the transmitting side from transition of a signal point of a signal modulated by a digital modulation method, A

phase of a signal point before transition of a modulating signal or a signal point after transition was changed before a band limit, and in a receiver, a phase of a modulating signal after said phase change is controlled, and it was made to consider it as a modulating signal before a phase change.
[0014]
According to this method, according to information on a phase change, it can restore to a signal which it judged with a peak power occurring, and a phase of one of signal points was changed before transition of a modulating signal, or after transition, and was transmitted at the transmitting side correctly after reception by changing a phase of a signal after orthogonal demodulation.
[0015]
[Embodiment of the Invention]
When the zone of the signal which carried out digital modulation was restricted, this invention person finds out that an adjoining signal laps, intersymbol interference occurs, and the large signal of a peak power occurs when signals with large amplitude lap, and came to do this invention.
[0016]
Namely, the main point of this invention judges generating of a peak power from transition of the signal point of the signal modulated by the digital modulation method, When it judges with a peak power occurring, it is changing the phase contrast of the signal point of the signal point before transition of a modulating signal, and the transition back, preventing signals with large amplitude lapping, and preventing generating of the large signal of a peak power. And it is easing the increase of a dynamic range required of the communication apparatus which transmits the modulating signal after a band limit.
[0017]
Hereafter, an embodiment of the invention is described in detail with reference to drawings.
(Embodiment 1)
Drawing 1 is a block diagram showing the composition of the signal processor concerning the embodiment of the invention 1. the signal processor 100 of drawing 1 -- the digital modulation machine 101, the modulating-signal judgment part 102, the control signal generation machine 103, the phase control machine 104, the band limit filter 105, the quadrature modulation machine 106, ** et al. -- it is mainly constituted.
[0018]
In drawing 1, the digital modulation machine 101 outputs the modulating signal acquired by carrying out digital modulation of the send data to the modulating-signal judgment part 102 and the phase control machine 104. For example, the digital modulation machine 101 maps send data according to the signal point arrangement defined by quadrature amplitude modulations, such as a 16QAM (Quadrature Amplitude Modulation) method, and acquires a modulating signal.
[0019]
The modulating-signal judgment part 102 judges whether a peak power occurs from transition of the signal point of this modulating signal about the modulating signal modulated in the digital modulation machine 101. For example, the modulating-signal judgment part 102 measures transition of the predetermined signal point which continues 2 unit time, and when the signal point before transition and the signal point after transition are the same phases and both signal points are maximum amplitude values, it judges that a peak power occurs.
[0020]
And the modulating-signal judgment part 102 outputs a decision result to the control signal generation machine 103. For example, when it is judged that the modulating-signal judgment part 102 outputs the decision result "1", and a peak power does not generate it when it is judged that a peak power occurs, the modulating-signal judgment part 102 outputs the decision result "0."
[0021]
The control signal generation machine 103 outputs the phase control signal which carried out the phase shift to the phase control machine 104 and the exterior, when the decision result of the modulating-signal judgment part 102 is the judgment which a peak power generates. The control signal generation machine 103 outputs the phase control signal which has not carried out a phase shift to the phase control machine 104, when the decision result of the modulating-signal judgment part 102 is the judgment which a peak power does not generate. This phase control signal sets a unit vector, i.e.,

amplitude value, to "1" (non-unit), changes only the phase of a modulating signal, and does not change amplitude value.
[0022]
The phase control machine 104 changes the phase of a modulating signal using the control signal outputted from the control signal generation machine 103. For example, the phase control machine 104 outputs the modulating signal acquired by carrying out complex multiplication of the control signal and modulating signal which were outputted from the control signal generation machine 103 to the band limit filter 105. Any of the signal point before transition or the signal point after transition may be sufficient as the signal point to which a phase is changed among the signal points of a modulating signal.
[0023]
For example, the phase control machine 104 changes the phase of the signal point after transition 90 degrees, and changes the phase contrast of the signal point before transition, and the signal point after transition.
[0024]
As a result, when it is judged that a peak power occurs, the phase contrast of the signal point of the signal point before transition of a modulating signal and the transition back changes. When it is judged that a peak power does not occur, the phase contrast of the signal point of the signal point before transition of a modulating signal and the transition back does not change.
[0025]
The band limit filter 105 restricts the zone of the modulating signal outputted from the phase control machine 104. And the band limit filter 105 is outputted to the quadrature modulation machine 106 by making the band-limited modulating signal into a rectangular baseband signal. The quadrature modulation machine 106 modulates and outputs a rectangular baseband signal.
[0026]
Next, operation of the signal processor concerning this embodiment is explained. Drawing 2 is a flow chart showing an example of operation of the signal processor of this embodiment.
[0027]
In Step (henceforth "ST") 201, digital modulation of the send data is carried out in the digital modulation machine 101. In ST202, it is judged in the modulating-signal judgment part 102 whether a peak power occurs in a modulating signal. When a peak power occurs in a modulating signal, it progresses to ST203, and when a peak power does not occur in a modulating signal, it progresses to ST204.
[0028]
In ST203, a modulating signal changes a predetermined part phase in the phase control machine 104. In ST204, the zone of a modulating signal is restricted in the band limit filter 105. In ST205, quadrature modulation of the modulating signal is carried out in the quadrature modulation machine 106.
[0029]
Thus, according to the signal processor of this embodiment, generating of a peak power is judged from transition of the signal point of the signal modulated by the digital modulation method, When transition of a signal point is predetermined transition, judge with a peak power occurring and the phase of one of signal points is changed before transition of a modulating signal, or after transition, It can prevent signals with large amplitude lapping, generating of the large signal of a peak power can be prevented, and the dynamic range of the modulating signal after a band limit can be oppressed.
[0030]
In the above-mentioned explanation, when the signal point before transition and the signal point after transition are the same phases and both signal points are maximum amplitude values, it has judged that a peak power occurs, but it will not be limited especially if it is the conditions which a peak power generates.
[0031]
The example hereafter judged as a peak power occurring is explained. Drawing 3 is a figure showing an example of the signal point arrangement of a 16QAM method. In drawing 3, the signal points 301-334 show the signal point modulated by 16QAM.
[0032]
For example, since the signal point before and behind transition is the same phase and both signal points

are maximum amplitude values when the signal point 301 continues, the modulating-signal judgment part 102 judges that a peak power occurs. Similarly, since the signal point before and behind transition is the same phase and both signal points are maximum amplitude values when the signal point 311 continues and the signal point 321 continues, or when the signal point 331 continues, the modulating-signal judgment part 102 judges that a peak power occurs.

[0033]

As another example, the signal point before and behind transition is the same phase or a phase different 180 degrees, and both signal points are maximum amplitude values, and the modulating-signal judgment part 102 judges that a peak power occurs, when changing from the signal point 301 at the signal point 301 or the signal point 321. When similarly the modulating-signal judgment part 102 changes from the signal point 311 at the signal point 311 or the signal point 331, When changing from the signal point 321 at the signal point 321 or the signal point 301, when changing from the signal point 331 at the signal point 331 or the signal point 311, the signal point before and behind transition is the same phase or a phase different 180 degrees, and both signal points are maximum amplitude values, and it is judged that a peak power occurs.

[0034]

As another example, the modulating-signal judgment part 102, When changing from either of the signal points 301, 302, and 303 to either of the signal points 301, 302, and 303, When each signal point before and behind transition is either of the signal points when the distance during a signal point is the nearest at the signal point of the peak magnitude, or the signal point of the first half peak magnitude, it is judged that a peak power occurs.

[0035]

Similarly when changing from either of the signal points 311, 312, and 313 to either of the signal points 311, 312, and 313, the modulating-signal judgment part 102 the modulating-signal judgment part 102, When changing from either of the signal points 321, 322, and 323 to either of the signal points 321, 322, and 323, the modulating-signal judgment part 102, When changing from either of the signal points 331, 332, and 333 to either of the signal points 331, 332, and 333, each signal point before and behind transition is either of the signal points when the distance during a signal point is the nearest, and judges at the signal point of the peak magnitude, or the signal point of the first half peak magnitude that a peak power occurs.

[0036]

As another example, the modulating-signal judgment part 102, When changing to either of the signal point 301 to the signal points 301, 302, and 303, Or when changing from the signal points 301, 302, and 303 at the signal point 301, Since each signal point before and behind transition is either of the signal points when the distance during a signal point is the nearest at the signal point of the peak magnitude, or the signal point of the first half peak magnitude and one side of the signal point before and behind transition is a signal point of the peak magnitude, it is judged that a peak power occurs.

[0037]

When similarly the modulating-signal judgment part 102 changes to either of the signal point 311 to the signal points 311, 312, and 313, When changing from the signal points 311, 312, and 313 at the signal point 311 and changing to either of the signal point 321 to the signal points 321, 322, and 323, When changing from the signal points 321, 322, and 323 at the signal point 321 and changing to either of the signal point 331 to the signal points 331, 332, and 333, Or when changing from the signal points 331, 332, and 333 at the signal point 331, Since each signal point before and behind transition is either of the signal points when the distance during a signal point is the nearest at the signal point of the peak magnitude, or the signal point of the first half peak magnitude and one side of the signal point before and behind transition is a signal point of the peak magnitude, it is judged that a peak power occurs.

[0038]

As another example, the modulating-signal judgment part 102, When changing to either of the signal points 301, 302, 303, 321, 322, and 323 from either of the signal points 301, 302, 303, 321, 322, and 323, It is the signal point of the peak magnitude when a phase differs in each signal point before and behind transition from the signal point of the peak magnitude, or the signal point of the first half peak magnitude about 180 degrees or said one of signal points, or signal point when the distance during a signal point is

the nearest, and it is judged that a peak power occurs.
[0039]
Similarly, when changing to either of the signal points 311, 312, 313, 331, 332, and 333 from either of the signal points 311, 312, 313, 331, 332, and 333, the modulating-signal judgment part 102, It is the signal point of the peak magnitude when a phase differs in each signal point before and behind transition from the signal point of the peak magnitude, or the signal point of the first half peak magnitude about 180 degrees or said one of signal points, or signal point when the distance during a signal point is the nearest, and it is judged that a peak power occurs.
[0040]
As another example, the modulating-signal judgment part 102, When changing to either of the signal point 301 or 321 to the signal points 301, 302, 303, 321, 322, and 323, Or when changing at the signal point 301 or 321 from either of the signal points 301, 302, 303, 321, 322, and 323, The signal point of the peak magnitude when a phase differs in each signal point before and behind transition from the signal point of the peak magnitude, or the signal point of the first half peak magnitude about 180 degrees, And since it is either said one of signal points or signal point when the distance during a signal point is the nearest and one side of the signal point before and behind transition is a signal point of the peak magnitude, it is judged that a peak power occurs.
[0041]
When similarly the modulating-signal judgment part 102 changes to either of the signal point 311 or 331 to the signal points 311, 312, 313, 331, 332, and 333, Or when changing at the signal point 311 or 331 from either of the signal points 311, 312, 313, 331, 332, and 333, The signal point of the peak magnitude when a phase differs in each signal point before and behind transition from the signal point of the peak magnitude, or the signal point of the first half peak magnitude about 180 degrees, And since it is either said one of signal points or signal point when the distance during a signal point is the nearest and one side of the signal point before and behind transition is a signal point of the peak magnitude, it is judged that a peak power occurs.
[0042]
The digital modulation method in particular of the signal which the signal processor of this embodiment treats is not limited, but can apply quadrature amplitude modulation methods, such as the modulation method which a peak power may generate, for example, 16QAM, and 64QAM.
[0043]
And when the signal point when the amplitude of a digital quadrature amplitude modulation method is large continues, generating of the large signal of a peak power can be prevented and the dynamic range of the modulating signal after a band limit can be oppressed.
[0044]
When it is judged that a peak power occurs, the modulating-signal judgment part 102 outputs the decision result "1", by the above-mentioned explanation, when it is judged that a peak power does not occur, the modulating-signal judgment part 102 explains the example which outputs the decision result "0", but. What is necessary is just to be able to distinguish a decision result, and if it is a signal which can identify two states, it is applicable with any values.
[0045]
Although the amplitude value of a phase control signal considers it as the signal of "1" and is considering it as the operation to which only a phase is changed in the above-mentioned explanation, without changing the amplitude value of a modulating signal, Amplitude value of not only this but a phase control signal may be made into the value of more than "1" or less than "1", and the phase of a modulating signal may be changed, and the amplitude value of a modulating signal may be amplified or attenuated.
[0046]
In the above-mentioned explanation, although the phase of a modulating signal is changed 90 degrees, the variation of a phase is not limited to this. For example, the phase of a modulating signal may be changed 135 degrees. Since the signal point after changing a phase by making change of a phase into 135 etc. degrees etc. in the case of multiple-value quadrature amplitude modulations, such as 16QAM, does not fall on other signal points, the signal point which changed the phase, and the signal point which

is not changing can be distinguished, and it can also transmit.
[0047]
The variation of a phase may not be constant and all should just be the variation which can reduce a peak power.
[0048]
In the above-mentioned embodiment, when it is judged that a peak power does not occur, it supposes that the phase contrast of the signal point of the signal point before transition of a modulating signal and the transition back will not change, but the changing method of a phase is not restricted to this. For example, when it is judged that a peak power does not occur, it is good also considering the phase of the signal point before transition of a modulating signal, or the signal point after transition as a predetermined phase.
[0049]
Next, a receiver is explained. Drawing 4 is a block diagram showing the composition of the signal processor concerning the embodiment of the invention 1. The signal processor 400 of drawing 4 mainly comprises the orthogonal demodulators 401, the control signal extractor 402, the phase control machine 403, and the digital demodulation machine 404.
[0050]
The orthogonal demodulators 401 restore to the received orthogonal modulation signal, and output a rectangular baseband signal to the phase control machine 403. The control signal extractor 402 extracts the information on a phase change from an input signal, and outputs it to the phase control machine 403.
[0051]
According to the information on a phase change, the phase control machine 403 changes the phase of a rectangular baseband signal, and is outputted to the digital demodulation machine 404. The digital demodulation machine 404 restores to a rectangular baseband signal according to the signal point arrangement defined by quadrature amplitude modulations, such as a 16QAM method, and obtains received data.
[0052]
Next, operation of the signal processor concerning this embodiment is explained. Drawing 5 is a flow chart showing an example of operation of the signal processor of this embodiment.
[0053]
In ST501, orthogonal demodulation of the received orthogonal modulation signal is carried out in the orthogonal demodulators 401. In ST502, it is judged in the control signal extractor 402 whether the information on a phase change is included in the control signal in an input signal. When the information on a phase change is included in a control signal, the information on a phase change is outputted to the phase control machine 403, and processing is moved to ST503. When the information on a phase change is not included in a control signal, processing is moved to ST504.
[0054]
In ST503, the phase of a rectangular baseband signal is changed in the phase control machine 403. In ST504, in the digital demodulation machine 404, digital demodulation of the rectangular baseband signal is carried out, and received data are obtained.
[0055]
Thus, according to the signal processor of this embodiment, according to the information on a phase change, by changing the phase of the signal after orthogonal demodulation at the transmitting side. It can restore to the signal which it judged with a peak power occurring, and the phase of one of signal points was changed before transition of a modulating signal, or after transition, and was transmitted correctly after reception.
[0056]
(Embodiment 2)
Drawing 6 is a block diagram showing the composition of the communication apparatus concerning the embodiment of the invention 2. The communication apparatus 600 of drawing 6 mainly comprises the signal processor 100 of Embodiment 1, the wireless transmission part 601, and the topology transmission section 602.

[0057]
The signal processor 100 carries out digital modulation of the send data, judges generating of a peak power from transition of the signal point of the signal modulated by the digital modulation method, and when it judges with a peak power occurring, it changes the phase contrast of the signal point of the signal point before transition of a modulating signal, and the transition back. And the signal processor 100 transmits a modulating signal to the wireless transmission part 601, and outputs the information on the phase change of a modulating signal to the topology transmission section 602.
[0058]
The wireless transmission part 601 changes into a radio frequency the modulating signal outputted from the signal processor 100, and transmits. The topology transmission section 602 changes into coding, abnormal conditions, and a radio frequency the information on the phase change of the modulating signal outputted from the signal processor 100, and transmits.
[0059]
Thus, according to the communication apparatus of this embodiment, generating of a peak power is judged from transition of the signal point of the signal modulated by the digital modulation method, When transition of a signal point is predetermined transition, judge with a peak power occurring and the phase of one of signal points is changed before transition of a modulating signal, or after transition, It can prevent signals with large amplitude lapping, generating of the large signal of a peak power can be prevented, and the dynamic range of the modulating signal after a band limit can be oppressed. As a result, the communication apparatus can oppress the dynamic range of a sending signal.
[0060]
According to the communication apparatus of this embodiment, the determining operation of the phase change in a receiver can be excluded by transmitting the information on the variation of the phase contrast of the modulating signal in a signal processor.
[0061]
Next, operation of a receiver is explained. The communication apparatus 700 of drawing 7 mainly comprises the signal processor 400 of Embodiment 1, the radio receiving part 701, and the topology receive section 702.
[0062]
The radio receiving part 701 receives the signal transmitted from the communication apparatus 600, carries out frequency conversion to a baseband signal, and is outputted to the signal processor 400. The topology receive section 702 receives the information on the phase change of the modulating signal transmitted from the communication apparatus 600, changes, gets over and decrypts to baseband frequency, and outputs to the signal processor 400. The signal processor 400 restores to the baseband signal outputted from the radio receiving part 701, after performing phase control according to the information on a phase change, and it obtains received data.
[0063]
Thus, according to the communication apparatus of this embodiment, according to the information on a phase change, by changing the phase of the signal after orthogonal demodulation at the transmitting side. It can restore to the signal which it judged with a peak power occurring, and the phase of one of signal points was changed before transition of a modulating signal, or after transition, and was transmitted correctly after reception.
[0064]
It is possible for this invention not to be limited to the above-mentioned embodiment, but to change variously, and to carry out. For example, although the above-mentioned embodiment explains the case where it carries out as a signal processor and a communication apparatus, it is also possible for it not to be restricted to this and to perform this signal processing method as software.
[0065]
For example, the program which performs the above-mentioned signal processing method is beforehand stored in ROM (Read Only Memory), and it may be made to operate the program by CPU (Central Processor Unit).
[0066]
The program which stored the program which performs the above-mentioned signal processing method

in the storage which can be read by computer, and was stored in the storage is recorded on RAM (Random Access memory) of a computer, It may be made to operate a computer according to the program.
[0067]

[Translation done.]

PRIOR ART

[Description of the Prior Art]
After carrying out digital modulation of the modulation part of the radio communications system using a digital quadrature modulation method conventionally, the composition which band-limits by using a band limit filter is used widely. Drawing 8 is a block diagram showing the composition of the conventional signal processor. In drawing 8, the signal processor 10 comprises the digital modulation machine 11, the band limit filter 12, and the quadrature modulation machine 13.
[0003]
The digital modulation machine 11 generates the orthogonal modulation signal acquired by carrying out digital modulation of the send data, and outputs it to the band limit filter 12. The band limit filter 12 outputs the rectangular baseband signal acquired by restricting the zone of an orthogonal modulation signal to the quadrature modulation machine 13. The quadrature modulation machine 13 outputs the transmit modulation signal acquired by carrying out quadrature modulation processing to the band-limited rectangular baseband signal.
[0004]

[Translation done.]

TECHNICAL FIELD

[Field of the Invention]
About a signal processor and a signal processing method, especially this invention is used for the modulating signal of radio communication equipment, and relates to a suitable signal processor and signal processing method.
[0002]

[Translation done.]

TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention]
However, in the signal (signal point) with which transmission time adjoins, in the conventional device, overlapping peak electric power generates the modulating signal which restricted the zone. In the case of the signal modulated especially by the rectangular multi-level modulation method, when signals with large amplitude lap, the large signal of amplitude value occurs. As a result, there is a problem which the dynamic range of the modulating signal after a band limit expands. And the linearity which covers a dynamic range to the device which processes a modulating signal is required.
[0005]
This invention is made in view of this point, and is a thing.
The purpose is to provide the signal processor and signal processing method which oppress the dynamic range of the modulating signal of **.

[0006]

SIGNAL PROCESSOR AND METHOD FOR SIGNAL PROCESSING

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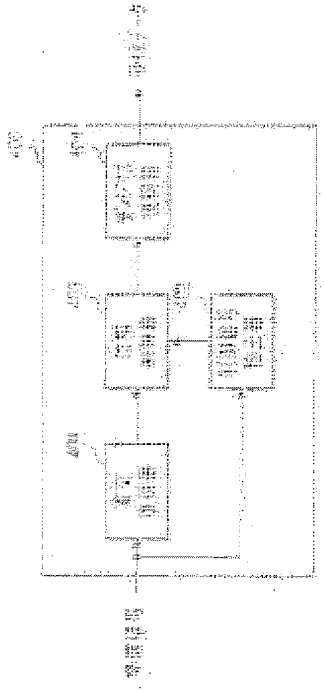
PROBLEM TO BE SOLVED: To suppress the dynamic range of a modulated signal after the band limited.



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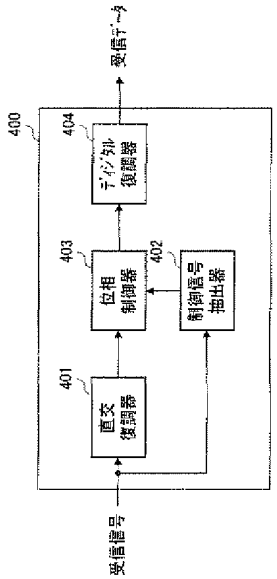
(54)【発明の名称】信号処理装置及び信号処理方法

(57)【要約】
【課題】帯域制限後の変調信号のダイナミックレンジを抑圧すること。
【解決手段】直交復調器４０１は、直交変調された信号を復調して直交ベースバンド信号を位相制御器４０３に出力する。制御信号抽出器４０２は、制御信号から位相変化の情報を抽出して位相制御器４０３に出力する。位相制御器４０３は、位相変化の情報に従い、直交ベースバンド信号の位相を変化させてディジタル復調器４０４に出力する。ディジタル復調器４０４は、１６ＱＡＭ方式等の直交振幅変調で定められる信号点配置に従って直交ベースバンド信号を復調して受信データを得る。
【選択図】　図４



【特許請求の範囲】
【請求項１】
ディジタル変調方式で変調された変調信号を送信した装置において、前記変調信号の位相を変化させた位相差の変化量の情報に基づいて前記変調信号の位相を制御する位相制御手段と、前記位相制御後の変調信号を復調する復調手段と、を具備する信号処理装置。
【請求項２】
前記位相制御手段は、信号の遷移前の信号点と遷移後との信号点の位相差を変化させる請求項１に記載の信号処理装置。
【請求項３】
前記位相制御手段は、位相差の変化量がない場合、変調信号の位相を所定の位相とする請求項１または請求項２に記載の信号処理装置。
【請求項４】
前記位相制御手段は、位相差の変化量がない場合、変調信号の位相を変化させない請求項１または請求項２に記載の信号処理装置。
【請求項５】
位相制御手段は、判定結果が所定の遷移である場合、変調信号の位相を所定の回転角度で変化させる請求項１から請求項４のいずれかに記載の信号処理装置。
【請求項６】
前記位相制御手段は、単位ベクトルを変調信号に乗算する請求項１から請求項５のいずれかに記載の信号処理装置。
【請求項７】
変調信号を受信する受信手段と、請求項１から請求項６のいずれかに記載の信号処理装置を具備する通信装置。
【請求項８】
位相差の変化量の情報を受信する位相情報受信手段を具備し、前記信号処理装置は、前記位相差の変化量の情報に従って受信した信号の位相を変化させる請求項７に記載の通信装置。
【請求項９】
送信側において、ディジタル変調方式で変調された信号の信号点の遷移からピーク電力が発生すると判定した場合、帯域制限前に変調信号の遷移前の信号点または遷移後の信号点の位相を変化させ、受信側において、前記位相変化後の変調信号の位相を制御して位相変化前の変調信号とすることを特徴とする信号処理方法。
【発明の詳細な説明】
【０００１】
【発明の属する技術分野】
本発明は、信号処理装置及び信号処理方法に関し、特に無線通信装置の変調信号に用いて好適な信号処理装置及び信号処理方法に関する。
【０００２】
【従来の技術】
従来、ディジタル直交変調方式を用いた無線通信システムの変調部は、ディジタル変調した後に帯域制限フィルタを用いて帯域制限を行う構成が広く用いられている。図８は、従来の信号処理装置の構成を示すブロック図である。図８において、信号処理装置１０は、ディジタル変調器１１と、帯域制限フィルタ１２と、直交変調器１３とから構成される。
【０００３】
ディジタル変調器１１は、送信データをディジタル変調し、得られた直交変調信号を生成して帯域制限フィルタ１２に出力する。帯域制限フィルタ１２は、直交変調信号の帯域を制限し、得られた直交ベースバンド信号を直交変調器１３に出力する。直交変調器１３は、帯域制限された直交ベースバンド信号に直交変調処理を行い、得られた送信変調信号を出力する。
【０００４】

【発明が解決しようとする課題】
しかしながら、従来の装置においては、帯域を制限した変調信号は、送信時刻が隣接する信号（信号点）が重なりピーク電力が発生する。特に直交多値変調方式で変調された信号の場合、振幅の大きい信号同士が重なることにより振幅値の大きい信号が発生する。この結果、帯域制限後の変調信号のダイナミックレンジが拡大する問題がある。そして、変調信号を処理する装置にダイナミックレンジをカバーする線形性が要求される。
【０００５】
本発明はかかる点に鑑みてなされたものであり、帯域制限後の変調信号のダイナミックレンジを抑圧する信号処理装置及び信号処理方法を提供することを目的とする。
【０００６】
【課題を解決するための手段】
本発明の信号処理装置は、ディジタル変調方式で変調された変調信号を送信した装置において、前記変調信号の位相を変化させた位相差の変化量の情報に基づいて前記変調信号の位相を制御する位相制御手段と、前記位相制御後の変調信号を復調する復調手段と、を具備する構成を採る。
【０００７】
本発明の信号処理装置は、前記位相制御手段は、信号の遷移前の信号点と遷移後との信号点の位相差を変化させる構成を採る。本発明の信号処理装置は、前記位相制御手段は、位相差の変化量がない場合、変調信号の位相を所定の位相とする構成を採る。本発明の信号処理装置は、前記位相制御手段は、位相差の変化量がない場合、変調信号の位相を変化させない構成を採る。本発明の信号処理装置は、位相制御手段は、判定結果が所定の遷移である場合、変調信号の位相を所定の回転角度で変化させる構成を採る。
【０００８】
これらの構成によれば、位相変化の情報に従い、直交復調後の信号の位相を変化させることにより、送信側で、ピーク電力が発生すると判定して変調信号の遷移前または遷移後いずれか一方の信号点の位相を変化させて送信した信号を、受信後、正しく復調できる。
【０００９】
本発明の信号処理装置は、前記位相制御手段は、単位ベクトルを変調信号に乗算する構成を採る。
【００１０】
この構成によれば、変調信号の振幅値を変化させずに、位相のみを変化させることができる。
【００１１】
本発明の通信装置は、変調信号を受信する受信手段と、上記の信号処理装置を具備する構成を採る。本発明の通信装置は、位相差の変化量の情報を受信する位相情報受信手段を具備し、前記信号処理装置は、前記位相差の変化量の情報に従って受信した信号の位相を変化させる構成を採る。
【００１２】
これらの構成によれば、位相変化の情報に従い、直交復調後の信号の位相を変化させることにより、送信側で、ピーク電力が発生すると判定して変調信号の遷移前または遷移後いずれか一方の信号点の位相を変化させて送信した信号を、受信後、正しく復調できる。
【００１３】
本発明の信号処理方法は、送信側において、ディジタル変調方式で変調された信号の信号点の遷移からピーク電力が発生すると判定した場合、帯域制限前に変調信号の遷移前の信号点または遷移後の信号点の位相を変化させ、受信側において、前記位相変化後の変調信号の位相を制御して位相変化前の変調信号とするようにした。
【００１４】
この方法によれば、位相変化の情報に従い、直交復調後の信号の位相を変化させることにより、送信側で、ピーク電力が発生すると判定して変調信号の遷移前または遷移後いずれか一方の信号点の位相を変化させて送信した信号を、受信後、正しく復調できる。

【００１５】
【発明の実施の形態】
本発明者は、ディジタル変調した信号の帯域を制限すると、隣接する信号が重なり符号間干渉が発生し、振幅の大きい信号同士が重なることによりピーク電力の大きい信号が発生することを見いだし、本発明をするに至った。
【００１６】
すなわち、本発明の骨子は、ディジタル変調方式で変調された信号の信号点の遷移からピーク電力の発生を判定し、ピーク電力が発生すると判定した場合、変調信号の遷移前の信号点と遷移後との信号点の位相差を変化させて、振幅の大きい信号同士が重なることを防ぎ、ピーク電力の大きい信号の発生を防ぐことである。そして、帯域制限後の変調信号を送信する通信装置に要求されるダイナミックレンジの増大を緩和することである。
【００１７】
以下、本発明の実施の形態について図面を参照して詳細に説明する。
（実施の形態１）
図１は、本発明の実施の形態１に係る信号処理装置の構成を示すブロック図である。図１の信号処理装置１００は、ディジタル変調器１０１と、変調信号判定部１０２と、制御信号生成器１０３と、位相制御器１０４と、帯域制限フィルタ１０５と、直交変調器１０６と、から主に構成される。
【００１８】
図１において、ディジタル変調器１０１は、送信データをディジタル変調し、得られた変調信号を変調信号判定部１０２と位相制御器１０４に出力する。例えば、ディジタル変調器１０１は、１６ＱＡＭ（Ｑｕａｄｒａｔｕｒｅ　Ａｍｐｌｉｔｕｄｅ　Ｍｏｄｕｌａｔｉｏｎ）方式等の直交振幅変調で定められる信号点配置に従って送信データをマッピングし、変調信号を得る。
【００１９】
変調信号判定部１０２は、ディジタル変調器１０１において変調された変調信号について、この変調信号の信号点の遷移からピーク電力が発生するか否か判定する。例えば、変調信号判定部１０２は、所定の２単位時間連続する信号点の遷移を測定し、遷移前の信号点と遷移後の信号点が同じ位相であり、かつ両方の信号点が最大振幅値である場合、ピーク電力が発生すると判断する。
【００２０】
そして、変調信号判定部１０２は、判定結果を制御信号生成器１０３に出力する。例えば、ピーク電力が発生すると判断した場合、変調信号判定部１０２は、判定結果「１」を出力し、ピーク電力が発生しないと判断した場合、変調信号判定部１０２は、判定結果「０」を出力する。
【００２１】
制御信号生成器１０３は、変調信号判定部１０２の判定結果が、ピーク電力が発生する判定であった場合、移相した位相制御信号を位相制御器１０４と外部に出力する。また、制御信号生成器１０３は、変調信号判定部１０２の判定結果が、ピーク電力が発生しない判定であった場合、移相していない位相制御信号を位相制御器１０４に出力する。この位相制御信号は、単位ベクトル、すなわち振幅値を「１」（無単位）とし、変調信号の位相のみを変化させ、振幅値を変化させない。
【００２２】
位相制御器１０４は、制御信号生成器１０３から出力された制御信号を用いて変調信号の位相を変化させる。例えば、位相制御器１０４は、制御信号生成器１０３から出力された制御信号と変調信号とを複素乗算し、得られた変調信号を帯域制限フィルタ１０５に出力する。変調信号の信号点のうち、位相を変化させる信号点は、遷移前の信号点または遷移後の信号点のいずれでも良い。
【００２３】
例えば、位相制御器１０４は、遷移後の信号点の位相を９０度変化させて、遷移前の信号

点と遷移後の信号点との位相差を変化させる。

【００２４】

この結果、ピーク電力が発生すると判断した場合、変調信号の遷移前の信号点と遷移後との信号点の位相差が変化する。また、ピーク電力が発生しないと判断した場合、変調信号の遷移前の信号点と遷移後との信号点の位相差が変化しない。

【００２５】

帯域制限フィルタ１０５は、位相制御器１０４から出力された変調信号の帯域を制限する。そして、帯域制限フィルタ１０５は、帯域制限した変調信号を直交ベースバンド信号として直交変調器１０６に出力する。直交変調器１０６は、直交ベースバンド信号を変調して出力する。

【００２６】

次に、本実施の形態に係る信号処理装置の動作について説明する。図２は、本実施の形態の信号処理装置の動作の一例を示すフロー図である。

【００２７】

ステップ（以下「ＳＴ」という）２０１では、ディジタル変調器１０１において、送信データがディジタル変調される。ＳＴ２０２では、変調信号判定部１０２において、変調信号にピーク電力が発生するか否か判定される。変調信号にピーク電力が発生する場合、ＳＴ２０３に進み、変調信号にピーク電力が発生しない場合、ＳＴ２０４に進む。

【００２８】

ＳＴ２０３では、位相制御器１０４において、変調信号が所定の分位相を変化される。ＳＴ２０４では、帯域制限フィルタ１０５において、変調信号の帯域が制限される。ＳＴ２０５では、直交変調器１０６において、変調信号が直交変調される。

【００２９】

このように、本実施の形態の信号処理装置によれば、ディジタル変調方式で変調された信号の信号点の遷移からピーク電力の発生を判定し、信号点の遷移が所定の遷移である場合、ピーク電力が発生すると判定して変調信号の遷移前または遷移後いずれか一方の信号点の位相を変化させて、振幅の大きい信号同士が重なることを防ぎ、ピーク電力の大きい信号の発生を防いで帯域制限後の変調信号のダイナミックレンジを抑圧することができる。

【００３０】

なお、上記説明では、遷移前の信号点と遷移後の信号点が同じ位相であり、かつ両方の信号点が最大振幅値である場合、ピーク電力が発生すると判断しているが、ピーク電力が発生する条件であれば特に限定されない。

【００３１】

以下、ピーク電力が発生すると判定する例について説明する。図３は、１６ＱＡＭ方式の信号点配置の一例を示す図である。図３において、信号点３０１～３３４は、１６ＱＡＭで変調された信号点を示す。

【００３２】

例えば、変調信号判定部１０２は、信号点３０１が連続する場合に、遷移前後の信号点が同じ位相であり、かつ両方の信号点が最大振幅値であるので、ピーク電力が発生すると判断する。同様に、変調信号判定部１０２は、信号点３１１が連続する場合、信号点３２１が連続する場合、または信号点３３１が連続する場合に遷移前後の信号点が同じ位相であり、かつ両方の信号点が最大振幅値であるので、ピーク電力が発生すると判断する。

【００３３】

また、別の例として、変調信号判定部１０２は、信号点３０１から信号点３０１または信号点３２１に遷移する場合に、遷移前後の信号点が同じ位相または１８０度異なる位相であり、かつ両方の信号点が最大振幅値であり、ピーク電力が発生すると判断する。同様に、変調信号判定部１０２は、信号点３１１から信号点３１１または信号点３３１に遷移する場合、信号点３２１から信号点３２１または信号点３０１に遷移する場合、信号点３３１から信号点３３１または信号点３１１に遷移する場合遷移前後の信号点が同じ位相または１８０度異なる位相であり、かつ両方の信号点が最大振幅値であり、ピーク電力が発生

すると判断する。

【００３４】

また、別の例として、変調信号判定部１０２は、信号点３０１、３０２、３０３のいずれかから信号点３０１、３０２、３０３のいずれかに遷移する場合に、遷移前後の信号点それぞれが最大振幅の信号点、または前期最大振幅の信号点に信号点間距離が最も近い信号点のいずれかである場合、ピーク電力が発生すると判断する。

【００３５】

同様に、変調信号判定部１０２は、信号点３１１、３１２、３１３のいずれかから信号点３１１、３１２、３１３のいずれかに遷移する場合、変調信号判定部１０２は、信号点３２１、３２２、３２３のいずれかから信号点３２１、３２２、３２３のいずれかに遷移する場合、変調信号判定部１０２は、信号点３３１、３３２、３３３のいずれかから信号点３３１、３３２、３３３のいずれかに遷移する場合に、遷移前後の信号点それぞれが最大振幅の信号点、または前期最大振幅の信号点に信号点間距離が最も近い信号点のいずれかであり、ピーク電力が発生すると判断する。

【００３６】

また、別の例として、変調信号判定部１０２は、信号点３０１から信号点３０１、３０２、３０３のいずれかに遷移する場合、または信号点３０１、３０２、３０３から信号点３０１に遷移する場合に、遷移前後の信号点それぞれが最大振幅の信号点、または前期最大振幅の信号点に信号点間距離が最も近い信号点のいずれかであり、かつ遷移前後の信号点の一方が最大振幅の信号点であるので、ピーク電力が発生すると判断する。

【００３７】

同様に、変調信号判定部１０２は、信号点３１１から信号点３１１、３１２、３１３のいずれかに遷移する場合、信号点３１１、３１２、３１３から信号点３１１に遷移する場合、信号点３２１から信号点３２１、３２２、３２３のいずれかに遷移する場合、信号点３２１、３２２、３２３から信号点３２１に遷移する場合、信号点３３１から信号点３３１、３３２、３３３のいずれかに遷移する場合、または信号点３３１、３３２、３３３から信号点３３１に遷移する場合に、遷移前後の信号点それぞれが最大振幅の信号点、または前期最大振幅の信号点に信号点間距離が最も近い信号点のいずれかであり、かつ遷移前後の信号点の一方が最大振幅の信号点であるので、ピーク電力が発生すると判断する。

【００３８】

また、別の例として、変調信号判定部１０２は、信号点３０１、３０２、３０３、３２１、３２２、３２３のいずれかから信号点３０１、３０２、３０３、３２１、３２２、３２３のいずれかに遷移する場合に、遷移前後の信号点それぞれが最大振幅の信号点、または前期最大振幅の信号点と１８０度位相が異なる最大振幅の信号点、そして前記いずれかの信号点と信号点間距離が最も近い信号点のいずれかであり、ピーク電力が発生すると判断する。

【００３９】

同様に、変調信号判定部１０２は、信号点３１１、３１２、３１３、３３１、３３２、３３３のいずれかから信号点３１１、３１２、３１３、３３１、３３２、３３３のいずれかに遷移する場合に、遷移前後の信号点それぞれが最大振幅の信号点、または前期最大振幅の信号点と１８０度位相が異なる最大振幅の信号点、そして前記いずれかの信号点と信号点間距離が最も近い信号点のいずれかであり、ピーク電力が発生すると判断する。

【００４０】

また、別の例として、変調信号判定部１０２は、信号点３０１、または３２１から信号点３０１、３０２、３０３、３２１、３２２、３２３のいずれかに遷移する場合、または信号点３０１、３０２、３０３、３２１、３２２、３２３のいずれかから信号点３０１、または３２１に遷移する場合に、遷移前後の信号点それぞれが最大振幅の信号点、または前期最大振幅の信号点と１８０度位相が異なる最大振幅の信号点、そして前記いずれかの信号点と信号点間距離が最も近い信号点のいずれかであり、かつ遷移前後の信号点の一方が最大振幅の信号点であるので、ピーク電力が発生すると判断する。

【００４１】
同様に、変調信号判定部１０２は、信号点３１１、または３３１から信号点３１１、３１２、３１３、３３１、３３２、３３３のいずれかに遷移する場合、または信号点３１１、３１２、３１３、３３１、３３２、３３３のいずれかから信号点３１１、または３３１に遷移する場合に、遷移前後の信号点それぞれが最大振幅の信号点、または前期最大振幅の信号点と１８０度位相が異なる最大振幅の信号点、そして前記いずれかの信号点と信号点間距離が最も近い信号点のいずれかであり、かつ遷移前後の信号点の一方が最大振幅の信号点であるので、ピーク電力が発生すると判断する。
【００４２】
また、本実施の形態の信号処理装置が扱う信号のディジタル変調方式は、特に限定されず、ピーク電力が発生する可能性のある変調方式、例えば１６ＱＡＭ、６４ＱＡＭ等の直交振幅変調方式を適用することができる。
【００４３】
そして、ディジタル直交振幅変調方式の振幅の大きい信号点が連続する場合にピーク電力の大きい信号の発生を防いで帯域制限後の変調信号のダイナミックレンジを抑圧することができる。
【００４４】
また、上記説明では、ピーク電力が発生すると判断した場合、変調信号判定部１０２は、判定結果「１」を出力し、ピーク電力が発生しないと判断した場合、変調信号判定部１０２は、判定結果「０」を出力する例を説明しているが、判定結果を区別することができればよく、２つの状態を識別できる信号であればどのような値でも適用できる。
【００４５】
また、上記説明では、位相制御信号の振幅値が「１」の信号とし、変調信号の振幅値を変化させずに、位相のみを変化させる動作としているが、これに限らず、位相制御信号の振幅値を「１」以上または「１」未満の値とし、変調信号の位相を変化させ、かつ変調信号の振幅値を増幅または減衰させても良い。
【００４６】
また、上記説明では、変調信号の位相を９０度変化させているが、位相の変化量はこれに限定されない。例えば、変調信号の位相を１３５度変化させても良い。１６ＱＡＭ等の多値直交振幅変調の場合、位相の変化を１３５度等にすることにより、位相を変化させた後の信号点が他の信号点に重ならないため、位相を変化した信号点と変化してない信号点とを区別し送信することもできる。
【００４７】
また、位相の変化量は、一定でなくても良く、いずれもピーク電力を低減することができる変化量であればよい。
【００４８】
また、上記実施の形態では、ピーク電力が発生しないと判断した場合、変調信号の遷移前の信号点と遷移後との信号点の位相差が変化しないとしているが、位相の変化方法は、これに限らない。例えば、ピーク電力が発生しないと判断した場合、変調信号の遷移前の信号点または遷移後の信号点の位相を所定の位相としてもよい。
【００４９】
次に、受信側について説明する。図４は、本発明の実施の形態１に係る信号処理装置の構成を示すブロック図である。図４の信号処理装置４００は、直交復調器４０１と、制御信号抽出器４０２と、位相制御器４０３と、ディジタル復調器４０４とから主に構成される。
【００５０】
直交復調器４０１は、受信した直交変調信号を復調して直交ベースバンド信号を位相制御器４０３に出力する。制御信号抽出器４０２は、受信信号から位相変化の情報を抽出して位相制御器４０３に出力する。
【００５１】

位相制御器４０３は、位相変化の情報に従い、直交ベースバンド信号の位相を変化させてディジタル復調器４０４に出力する。ディジタル復調器４０４は、１６ＱＡＭ方式等の直交振幅変調で定められる信号点配置に従って直交ベースバンド信号を復調して受信データを得る。

【００５２】

次に、本実施の形態に係る信号処理装置の動作について説明する。図５は、本実施の形態の信号処理装置の動作の一例を示すフロー図である。

【００５３】

ＳＴ５０１では、直交復調器４０１において、受信した直交変調信号が直交復調される。ＳＴ５０２では、制御信号抽出器４０２において、受信信号中の制御信号に位相変化の情報が含まれるか否か判断する。制御信号に位相変化の情報が含まれる場合、位相変化の情報が位相制御器４０３に出力され、ＳＴ５０３に処理を移す。また、制御信号に位相変化の情報が含まれない場合、ＳＴ５０４に処理を移す。

【００５４】

ＳＴ５０３では、位相制御器４０３において、直交ベースバンド信号の位相を変化させる。ＳＴ５０４では、ディジタル復調器４０４において、直交ベースバンド信号がディジタル復調され、受信データが得られる。

【００５５】

このように、本実施の形態の信号処理装置によれば、位相変化の情報に従い、直交復調後の信号の位相を変化させることにより、送信側で、ピーク電力が発生すると判定して変調信号の遷移前または遷移後いずれか一方の信号点の位相を変化させて送信した信号を、受信後、正しく復調できる。

【００５６】

（実施の形態２）

図６は、本発明の実施の形態２に係る通信装置の構成を示すブロック図である。図６の通信装置６００は、実施の形態１の信号処理装置１００と、無線送信部６０１と、位相情報送信部６０２とから主に構成される。

【００５７】

信号処理装置１００は、送信データをディジタル変調し、ディジタル変調方式で変調された信号の信号点の遷移からピーク電力の発生を判定し、ピーク電力が発生すると判定した場合、変調信号の遷移前の信号点と遷移後との信号点の位相差を変化させる。そして、信号処理装置１００は、変調信号を無線送信部６０１に送信し、変調信号の位相変化の情報を位相情報送信部６０２に出力する。

【００５８】

無線送信部６０１は、信号処理装置１００から出力された変調信号を無線周波数に変換して送信する。位相情報送信部６０２は、信号処理装置１００から出力された変調信号の位相変化の情報を符号化、変調、無線周波数に変換して送信する。

【００５９】

このように、本実施の形態の通信装置によれば、ディジタル変調方式で変調された信号の信号点の遷移からピーク電力の発生を判定し、信号点の遷移が所定の遷移である場合、ピーク電力が発生すると判定して変調信号の遷移前または遷移後いずれか一方の信号点の位相を変化させて、振幅の大きい信号同士が重なることを防ぎ、ピーク電力の大きい信号の発生を防いで帯域制限後の変調信号のダイナミックレンジを抑圧することができる。この結果、通信装置は、送信信号のダイナミックレンジを抑圧することができる。

【００６０】

また、本実施の形態の通信装置によれば、信号処理装置における変調信号の位相差の変化量の情報を送信することにより、受信側での位相変化の判定動作を省くことができる。

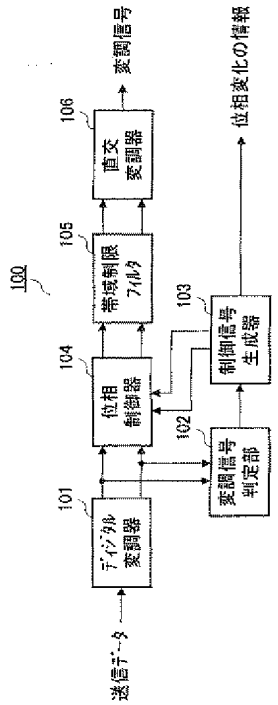
【００６１】

次に、受信側の動作について説明する。図７の通信装置７００は、実施の形態１の信号処理装置４００と、無線受信部７０１と、位相情報受信部７０２とから主に構成される。

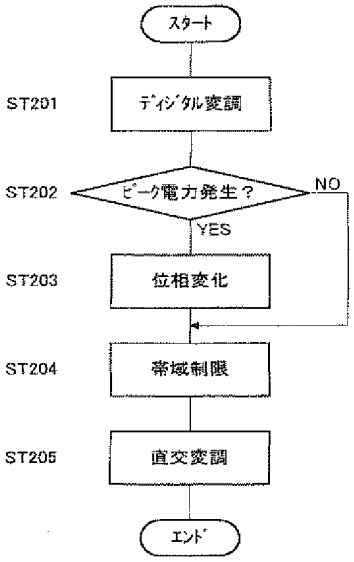
【００６２】
無線受信部７０１は、通信装置６００から送信された信号を受信し、ベースバンド信号に周波数変換して信号処理装置４００に出力する。位相情報受信部７０２は、通信装置６００から送信された変調信号の位相変化の情報を受信し、ベースバンド周波数に変換、復調、復号化して信号処理装置４００に出力する。信号処理装置４００は、無線受信部７０１から出力されたベースバンド信号を位相変化の情報に従い、位相制御を行った後、復調して受信データを得る。
【００６３】
このように、本実施の形態の通信装置によれば、位相変化の情報に従い、直交復調後の信号の位相を変化させることにより、送信側で、ピーク電力が発生すると判定して変調信号の遷移前または遷移後いずれか一方の信号点の位相を変化させて送信した信号を、受信後、正しく復調できる。
【００６４】
なお、本発明は上記実施の形態に限定されず、種々変更して実施することが可能である。例えば、上記実施の形態では、信号処理装置及び通信装置として行う場合について説明しているが、これに限られるものではなく、この信号処理方法をソフトウェアとして行うことも可能である。
【００６５】
例えば、上記信号処理方法を実行するプログラムを予めＲＯＭ（Ｒｅａｄ　Ｏｎｌｙ　Ｍｅｍｏｒｙ）に格納しておき、そのプログラムをＣＰＵ（Ｃｅｎｔｒａｌ　Ｐｒｏｃｅｓｓｏｒ　Ｕｎｉｔ）によって動作させるようにしても良い。
【００６６】
また、上記信号処理方法を実行するプログラムをコンピュータで読み取り可能な記憶媒体に格納し、記憶媒体に格納されたプログラムをコンピュータのＲＡＭ（Ｒａｎｄｏｍ　Ａｃｃｅｓｓ　ｍｅｍｏｒｙ）に記録して、コンピュータをそのプログラムにしたがって動作させるようにしても良い。
【００６７】
【発明の効果】
以上説明したように、本発明の信号処理装置及び信号処理方法によれば、ディジタル変調方式で変調された信号の信号点の遷移からピーク電力の発生を判定し、信号点の遷移が所定の遷移である場合、ピーク電力が発生すると判定して変調信号の遷移前または遷移後いずれか一方の信号点の位相を変化させて、振幅の大きい信号同士が重なることを防ぎ、ピーク電力の大きい信号の発生を防いで帯域制限後の変調信号のダイナミックレンジを抑圧することができる。
【図面の簡単な説明】
【図１】本発明の実施の形態１に係る信号処理装置の構成を示すブロック図
【図２】上記実施の形態の信号処理装置の動作の一例を示すフロー図
【図３】１６ＱＡＭ方式の信号点配置の一例を示す図
【図４】上記実施の形態に係る信号処理装置の構成を示すブロック図
【図５】上記実施の形態の信号処理装置の動作の一例を示すフロー図
【図６】本発明の実施の形態２に係る通信装置の構成を示すブロック図
【図７】上記実施の形態に係る通信装置の構成を示すブロック図
【図８】従来の信号処理装置の構成を示すブロック図
【符号の説明】
１０１　ディジタル変調器
１０２　変調信号判定部
１０３　制御信号生成器
１０４、４０３　位相制御器
１０５　帯域制限フィルタ
１０６　直交変調器

４０１　直交復調器
４０２　制御信号抽出器
４０４　ディジタル復調器
６０１　無線送信部
６０２　位相情報送信部
７０１　無線受信部
７０２　位相情報受信部

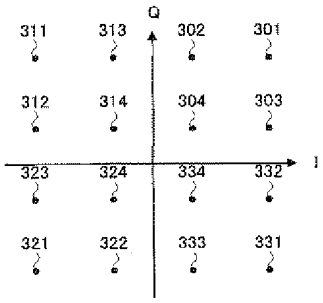
【図１】



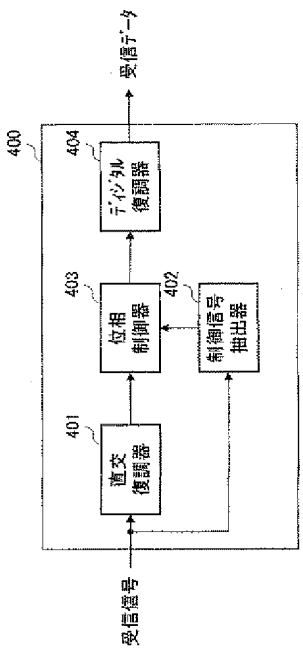
【図２】



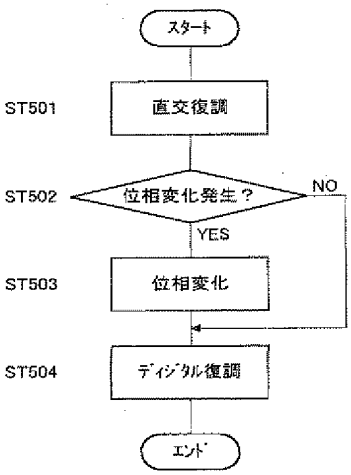
【図３】


Q
I
311
313
302
301
312
314
304
303
323
324
334
332
321
322
333
331

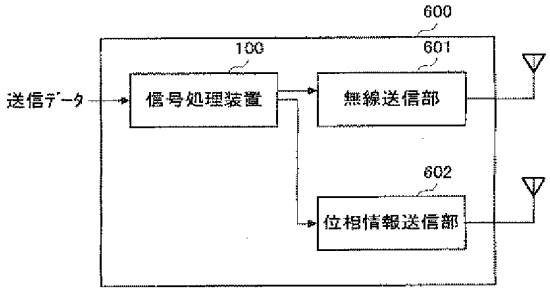
【図４】


受信データ
400
404
ディジタル復調器
403
位相制御器
402
制御信号抽出器
401
直交復調器
受信信号

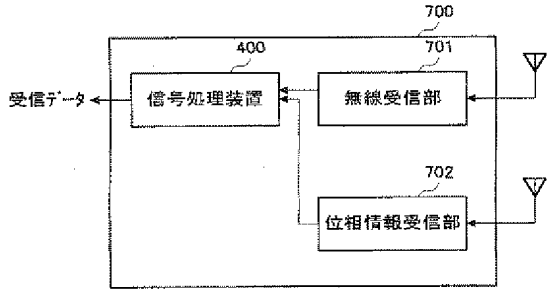
【図５】


スタート
ST501
直交復調
ST502
位相変化発生？
NO
YES
ST503
位相変化
ST504
ディジタル復調
エンド

【図６】


600
100
601
送信データ
信号処理装置
無線送信部
602
位相情報送信部

【図７】


700
400
701
受信データ
信号処理装置
無線受信部
702
位相情報受信部

【図８】